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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/776,184	02/12/2004	Takao Ohno	Q79839	3094

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EXAMINER
VO, HAI

ART UNIT	PAPER NUMBER
1771	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/776,184	OHNO ET AL.	
	Examiner	Art Unit	
	Hai Vo	1771	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 July 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-35* is/are pending in the application.

4a) Of the above claim(s) *8-32* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3-7 and 33-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. All of the art rejections are maintained.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3, 4, 33 and 34 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Daido et al (US 6,291,106). Daido teaches a porous film made from a polymetaphenylene isophthalate has a gas permeability of 20 sec/100 cc.in^2 or less and a thickness of 50 microns or less (column 7, lines 1-5). According to Applicant's calculation, the porous film of the present invention has a gas permeability of 0.1-500 sec/100 cc.in^2 which is equivalent to 0.2 - 1000 ml/sec as set out in the claims (page 2 of the 10/05/2006 amendment). Likewise, the Daido porous film has the gas permeability overlapping with the claimed range. The porous film has a

porosity of 62% and a density of 0.53 g/cm3 (example 1). The porous film can be used for forming a battery separator (column 4, lines 25-30). Daido does not specifically disclose the cross-sectional pore laminar coefficient, specific Young Modulus and percent of gas permeability retained after heat treatment at 350°C for 10 min. However, since the porous film of Daido is made of the same material as that of the present invention and has a thickness, porosity, density and gas permeability within the claimed ranges, it is not seen that the porous resin film of Daido would have performed differently than that of the present invention in terms of the cross-sectional pore laminar coefficient, specific Young Modulus and percent of gas permeability retained after heat treatment at 350°C for 10 mins so as to efficiently function as a battery separator. Accordingly, Daido anticipates or strongly suggests the claimed subject matter.

5. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Daido et al (US 6,291,106) in view of Shinohara et al (US 6,447,958). Daido does not specifically disclose the porous film containing inorganic whiskers. Shinohara, however, discloses a porous film as a battery separator comprising a heat resistant polymer and a ceramic powder wherein the heat resistant polymer includes both meta-oriented aromatic polyamide and para-oriented aromatic polyamide (column 3, lines 40-55). Shinohara discloses the ceramic powder present in the amount of 5 to 100 parts by weight per 100 parts by weight of a heat-resistant polymer (column 8, lines 1-3). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made

to add ceramic powder in the film composition motivated by the desire to provide a battery separator with increased permeability and improvement of safety under a high temperature.

6. Claims 5-7 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Daido et al (US 6,291,106) in view of Tsutsumi et al (US 5,571,875). Daido does not specifically disclose the porous film containing inorganic whiskers. Tsutsumi teaches a polyimide based resin composition that is excellent in processibility and has improved mechanical characteristics, heat resistance and chemical resistance (column 3, lines 5-10). Tsutsumi teaches a resin composition comprising a polyimide resin, a polymetaphenylene isophthalamide and inorganic whiskers having a fiber length L from 5 to 50 microns and a fiber diameter D from 0.05 to 1 microns within the claimed range (column 20, lines 30-50 and column 22, lines 30-33). The whiskers are present in an amount ranging from 5 to 100 wt% based on the weight of the resin composition (column 22, lines 43-45). Such a dimension would have been recognized by one skilled in the art to impart the mechanical strength and dimensional stability while maintaining an ease of the film processing. As such, in the absence of unexpected results, it would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the ceramic powder having the L/D ratio as taught by Tsutsumi motivated by the desire to impart mechanical strength and dimensional stability while maintaining an ease of the film processing.

7. Claims 1, 3-6, 33, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinohara et al (US 6,447,958) in view of Cieslak et al (US 5,002,843). Shinohara discloses a porous film as a battery separator comprising a heat resistant polymer and a ceramic powder wherein the heat resistant polymer includes both meta-oriented aromatic polyamide and para-oriented aromatic polyamide (column 3, lines 40-55). Shinohara discloses the porous film having a porosity greater than 50% and a thickness of 5 to 30 microns or less (column 5, lines 65-67 and column 10, lines 20-22). Shinohara disclose the porous film having an air permeability of 680 cc/sec (column 18, lines 8-10). Shinohara discloses the ceramic powder present in the amount of 5 to 100 parts by weight per 100 parts by weight of a heat-resistant polymer (column 8, lines 1-3). Shinohara discloses the para-oriented aromatic polyamide is preferable because it tends to become porous (column 3, lines 55-56). However, there is no suggestion that the meta-oriented aromatic polyamide is excluded from the porous film. Shinohara does not disclose that polymetaphenylene isophthalamide is the meta-oriented aromatic polyamide. Cieslak, however, discloses a battery separator made from polyparaphenylene terephthalamide and polymetaphenylene isophthalamide (column 3, lines 35-37). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use polymetaphenylene isophthalamide because such is intended use of the material and Cieslak provides necessary details to practice the invention of Shinohara.

Shinohara does not specifically disclose a cross-sectional pore laminar coefficient, specific Young's modulus and percent of gas permeability retained after heat treatment at 350°C for 10 min. However, it appears that the porous film of Shinoraha as modified by Cieslak has the gas permeability, porosity, thickness within the claimed ranges. The resulting porous film is made from a composition similar to that of the present invention, i.e., the weight ratio of the heat resistant polymer to the whisker. Therefore, it is not seen that the resulting porous film would have performed differently than the porous film of the present invention in terms of the cross-sectional pore laminar coefficient, specific Young's modulus and percent of gas permeability retained after heat treatment at 350°C for 10 min so as to be suitable as the battery separator.

Response to Arguments

8. The art rejections based on Daido have been maintained for the following reasons. The declaration from Satoshi Nishikawa filed 07/23/2007 have been thoroughly reviewed and considered. However, the declaration is found convincing for patentability. An experimental working has been conducted to show that the Daido porous film as shown in example 1 does not have a cross-sectional pore laminar coefficient of 2.5 or greater. In the declaration, the cross-sectional pore laminar coefficient was calculated by the relation t.p/d wherein t is a thickness, p porosity and d maximum pore diameter. The thickness of the film as shown in example 1 is 36 microns, however, such a thickness is presented for the purpose of illustration only and is not intended to limit the scope of the

invention. Daido teaches the porous reinforcing material could have a thickness of 100 microns or less. Likewise, the cross-sectional pore laminar coefficient could be 4 based on a thickness of 100 microns, a porosity of 62% and a maxiumum pore diameter d of 15 microns. This is within the claimed range.

Applicants argue that the porous reinforcing material cannot be used by itself as a battery separator. There are two problems with the arguments. In the first place, nothing in the claims requires the battery separator *consisting of* a single polymetaphenylene isophthalamide porous film. Secondly, the fact that the combination of the porous reinforcing material with the gel electrolyte for forming a battery separator does not necessarily indicate that the porous reinforcing material is not self-supporting. To the examiner's understanding, "self supporting" means that the film is able to stand alone on its own weight. The porous film is self-supported as a non-woven fabric sheet with a basis weight of 19 g/m2 prior to impregnating with the gel electrolyte for forming an electrolytic solution supporting polymer film (example 1).

Applicants state that the gas permeability of the porous film as shown in example 1 is 0.08 ml/sec, which is outside the claimed range. The examiner respectfully disagrees. Again, the showing in example 1 is presented for the purpose of illustration only and is not intended to limit the scope of the invention. The examiner directs Applicants' attention to column 7, lines 1-5. The gas permeability of the porous reinforcing material is 20 sec/100 cc.in^2 or less, which gives 80 ml/sec or less. This falls within the claimed range.

Applicants argue that addition of ceramic powder to the film for providing mechanical strength and dimensional stability could not have been arrived at by the skilled in the art based on the teachings of Shinora and Daido. Incorporation of ceramic particles into the film would rather provide increased permeability and improvement of safety under a high temperature as pointed out by Applicants. Applicants' suggestions are acknowledged with appreciation. Note that changing of the motivational statements for combining the teachings of the references does not materially alter the basis of the obviousness rejections.

Applicants argue that the separator of the present invention and the separator of Shinora are significantly different. When the ceramic powder is less than 1%, it is impossible to form the pores within the separator of Shinora. On the other hand, the separator of the present invention could have so many pores without addition of ceramic powder. The arguments are not found persuasive for patentability because they are not commensurate in scope with the claims. None of these features have been presently claimed to show the distinction of the porous film of the present invention over the prior art.

Applicants further assert that the term "whisker" is related to a fibrous material having a specific aspect ratio and thus clearly differs from ceramic powder of Shinora. The examiner respectfully disagrees. "Whisker" generically includes particle, particulate, powder and fiber unless an aspect ratio is specifically claimed.

Applicants argues that Shinohara fails to teach the porous film having a specific Young's modulus of 200-5000(kgf/mm2)/(g/cm3) in at least one direction. Nowhere in Shinohara does teach or suggest the use of an m-aramid based polymer and inorganic whiskers. The examiner respectfully disagrees. Shinohara discloses a porous film as a battery separator comprising a heat resistant polymer and a ceramic powder wherein the heat resistant polymer includes both meta-oriented aromatic polyamide and para-oriented aromatic polyamide (column 3, lines 40-55). Shinohara discloses the porous film having a porosity greater than 50% and a thickness of 5 to 30 microns or less (column 5, lines 65-67 and column 10, lines 20-22). Shinohara disclose the porous film having an air permeability of 680 cc/sec (column 18, lines 8-10). Shinohara discloses the ceramic powder present in the amount of 5 to 100 parts by weight per 100 parts by weight of a heat-resistant polymer (column 8, lines 1-3). Shinohara discloses the para-oriented aromatic polyamide is preferable because it tends to become porous (column 3, lines 55-56). However, there is no suggestion that the meta-oriented aromatic polyamide is excluded from the porous film. Shinohara does not disclose that polymetaphenylene isophthalamide is the meta-oriented aromatic polyamide. Cieslak, however, discloses a battery separator made from polyparaphenylene terephthalamide and polymetaphenylene isophthalamide (column 3, lines 35-37). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use polymetaphenylene isophthalamide because such is intended

use of the material and Cieslak provides necessary details to practice the invention of Shinohara. However, it appears that the porous film of Shinohara as modified by Cieslak has the gas permeability, porosity, thickness within the claimed ranges. The resulting porous film is made from a composition similar to that of the present invention, i.e., the weight ratio of the heat resistant polymer to the whisker. Therefore, it is not seen that the resulting porous film would have performed differently than the porous film of the present invention in terms of the cross-sectional pore laminar coefficient, specific Young's modulus and percent of gas permeability retained after heat treatment at 350°C for 10 min so as to be suitable as the battery separator.

Applicants argue that nowhere Tsutsumi discloses the resin composition comprising a polyimide resin, poly-meta-phenyleneisophthalamide, a fiber length of 5 to 50 microns, and a fiber diameter D of the inorganic whiskers of 0.05 to 1 micron. That is not true. Tsutsumi teaches the polyimide based resin composition comprising a polyimide resin and additional resin such as aromatic polyamide resin (column 19, lines 30-40) wherein the aromatic polyamide resin includes poly-meta-phenyleneisophthalamide (column 20, lines 35-50). Tsutsumi further teaches the polyimide resin reinforced with ceramic whiskers (column 22, lines 20-30). Likewise, Tsutsumi broadly discloses ceramic whiskers usable with polyimide resin and poly-meta-phenyleneisophthalamide.

Applicants argue that Cieslak does not teach an m-aramid based polymer porous film as a separator but rather a meta-aramid fiber for the separator.

Cieslak does not need to teach an m-aramid based polymer porous film because such was already addressed by Shinohara. Accordingly, the art rejections are sustained.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai Vo whose telephone number is (571) 272-1485. The examiner can normally be reached on Monday through Thursday, from 9:00 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel Morris can be reached on (571) 272-1478. The fax

phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HV

/Hai Vo/
Primary Examiner, Art Unit 1771